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(54) PHOTOPOLYMERIZABLE COMPOSITION FOR COLOR FILTER AND COLOR FILTER

(57)Abstract:

PROBLEM TO BE SOLVED: To easily form a pattern of a thin film with high light-shielding property and to improve sensitivity, resolution, developing property and durability by incorporating a black coloring material, novolac epoxyacrylate having carboxyl groups, photopolymn. initiator and compd. having ethylenic unsatd. groups.

SOLUTION: This compsn. contains a black color material such as carbon black, a novolac epoxyacrylate having carboxyl groups, a photopolymn. initiator such as biimidazole deriv., and a compd. having one or more ethylenic unsatd. groups (ethylenic compd.). The novolac epoxyacrylate resin having carboxyl groups is obtd. by adding an unsatd. monocarboxylic acid to a novolac epoxy resin and further allowing a polybasic acid anhydride to react, and the obtd. resin preferably has 300 to 100000 weight average mol.wt. measured by GPC. As the ethylenic compd., esters of aliphatic (poly)hydroxy compds. and unsatd. carboxylic acids can be used.

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Notes:

1. Untranslatable words are replaced with asterisks (****).
2. Texts in the figures are not translated and shown as it is.

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FULL CONTENTS

[Claim(s)]

[Claim 1] (a) The photopolymerization nature constituent for light filters characterized by containing the compound which has the novolak epoxy acrylate which has the black color material and (b) carboxyl group, (c) photopolymerization initiator, and one or more (d) ethylene nature unsaturation machines.

[Claim 2] (a) The photopolymerization nature constituent for light filters according to claim 1 whose black color material is carbon black.

[Claim 3] (a) The photopolymerization nature constituent for light filters according to claim 1 or 2 whose content of a black color material is 35 - 70wt% of total solids.

[Claim 4] (c) The photopolymerization nature constituent for light filters according to claim 1 to 3 characterized by a photopolymerization initiator containing a biimidazole derivative.

[Claim 5] (c) The photopolymerization nature constituent for light filters according to claim 4 characterized by a photopolymerization initiator containing polyfunctional thiol further.

[Claim 6] Furthermore, the photopolymerization nature constituent for light filters according to claim 1 to 5 characterized by containing the polymer dispersant which has a basic functional group.

[Claim 7] The light filter characterized by having the black matrix which it comes to form with a photopolymerization nature constituent according to claim 1 to 6 on a substrate.

[Claim 8] The light filter according to claim 7 characterized by the optical density (OD) of a black matrix being more than 3.0/μm.

[Claim 9] The light filter according to claim 7 or 8 characterized by the range of the 20-degree gloss value of a black matrix being 100-200.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] While this invention relates to the light filter obtained from the photopolymerization nature constituent for light filters and this constituent which are used by manufacture of the optical light filter used for a color television, a liquid-crystal-display element, a solid state image pickup device, a camera, etc. and it is a high light sheilding in detail It is related with the photopolymerization nature constituent for light filters suitable for the black-matrix manufacture which was excellent in high sensitivity at development nature and high precision, and the light filter that has the resin black matrix of a high light sheilding.

[0002]

[Description of the Prior Art] A light filter usually forms a black matrix in the surface of transparent bases, such as glass and a plastic sheet, then forms three or more sorts of different hues, red, green, blue, etc., by color patterns, such as the shape of a stripe, or the shape of a mosaic, one by one. Although pattern size changes with the use and each color of a light filter, it is about 5-700micro. Moreover, the accuracy of position of superposition is several micro - tens ofmicro, and is manufactured by ultra-fine processing technology with high dimensional accuracy.

[0003] As the typical manufacture method of a light filter, there are a staining technique, the printing method, a pigment dispersion method, an electrodeposition process, etc. The photopolymerization nature constituent which contains the charge of a color material especially is applied on a transparent base among these, and they are image exposure, development, and necessity. The pigment dispersion method which forms a light filter picture by repeating hardening has high precision, such as a position of a light filter pixel, and thickness, is excellent in endurance, such as lightfastness and a heat-resisting property, and since there are few defects of a pinhole etc., it is adopted widely.

[0004] As for a black matrix, it is common between red, green, and a blue color pattern to arrange the shape of a lattice, the shape of a stripe, or in the shape of a mosaic, and the role which prevents the malfunction of TFT by the improvement in a contrast by the color mixture inhibition between each color or light leakage is played. For this reason, a high light sheilding is required of a black matrix. The black matrix had the common method of forming by metal membranes, such as chromium, conventionally. Since this technique is what vapor-deposits metals, such as chromium, and carries out etching treatment of the chromium layer through a FOTORISO process on a transparent base, a high light sheilding is acquired with high precision by thin thickness. On the other hand, a manufacturing process is the low long and technique of productivity, and it has problems, like the environmental problem by the waste fluid of a high cost and etching treatment etc. arises.

[0005] For this reason, the technique of forming low cost and a pollution-free black matrix (resin black matrix) with the photopolymer which distributed the pigment of a light sheilding and

the color is studied energetically. However, since the resin black matrix has a problem which is mentioned later, the present condition is that it is not yet utilizable. In order to make a light sheilding (optical density) equivalent to the black matrix by metal membranes, such as chromium, discover, in a resin black matrix, it is necessary to increase content of a light-sheilding pigment and a color, or to thicken thickness.

[0006] The flat nature of the coloring pixel of RGB which forms thickness on it in response to the influence of concavo-convex of black-matrix RIKUSU in the method of thickening is spoiled. For this reason, uneven-izing of a liquid crystal cell gap or the turbulence of the orientation of liquid crystal is generated, and the fall of labeling capability is caused. Moreover, the problem of disconnection of the transparent electrode ITO film prepared on a light filter occurring is also produced.

[0007] Moreover, in the method of increasing content of a light-sheilding pigment and a color, there is a problem on which the sensitivity of a photopolymer (black resist), development nature, definition, adhesion, etc. get worse, and the precision and reliability which are required not only of the fall of productivity but of a light filter are no longer acquired. That is, since the sensitive material which can demonstrate sensitivity, development nature, definition, and adhesion under a thin film and the conditions of a high light sheilding is not realizable, utilization of the resin black matrix is obstructed.

[0008] It is just going to be known conventionally about the technique of improving performances, such as sensitivity, development nature, definition, and adhesion, in the sensitization resin which has optical fixed penetrations, such as a common photopolymer or a coloring photosensitivity constituent for light filters. As the coloring composition for light filters which distributed the pigment in JP,1-152449,A, JP,1-254918,A, JP,2-153353,A, and JP,2-804,A Although that whose initiator is biimidazole in JP,6-75372,A and the presentation same at 6-75373 again about binder resin, a polyfunctional acrylic monomer, and the constituent that consists of a triazine compound as initiators is illustrated When it exposes in the air in the case of the constituent of the indication to these, in order to receive the polymerization inhibition by oxygen, in order to consider it as practical sensitivity, it is necessary to prepare oxygen interception films, such as polyvinyl alcohol, and the manufacturing process has the fault which becomes complicated.

[0009] By JP,4-340965,A, the coloring photosensitivity constituent which contains a polymerization nature compound so much is proposed as the technique of reducing the polymerization by oxygen which is the above-mentioned fault. However, it is difficult for there to be many polymerization nature compounds as 60% or more, to receive restrictions in coloring component loadings, and for a lot of colorants to apply to a required presentation like a resin black matrix. It is [the improvement effect is not enough or / problems, such as an odor and stability,] and is not practical although the polymerization inhibition reduction method by

adding an amino acid derivative or a phosphorus system compound is proposed in JP,6-27662,A and JP,3-36212,B.

[0010] Moreover, it is the technique of improving definition and development nature, For example, the binder resin which has the side chain double bond of illustration in JP,5-19467,A, Combination of the binder resin which controlled the molecular weight distribution of illustration to JP,6-175362,A, and polyfunctional thiol of the illustration to JP,5-281734,A, and JP,4-369653,A have addition of the organic carboxylic acid of illustration etc. These are all the constituents aiming at forming the coloring picture element part of RGB of a light filter, and the definition at the time of blending light-shielding pigments, such as carbon black, and development nature are unknown.

[0011] When protection-from-light capability is required in an optical full wave length field like a resin black matrix, 1) even if it hardens enough because the difference of the crosslinking density to a thickness direction occurs [that it is remarkably difficult to give the difference of the crosslinking density in a part for an exposure portion and an unexposed part, and] also in the portion by which 2 exposure was carried out, i.e., a photoirradiation surface In the basal surface, in order to blend a lot of insoluble black color materials with not hardening and three developers, it has been hindrance that the fall of development nature is remarkable etc., when giving sensitization characteristics remarkably.

[0012] Especially the phenomenon of 1 and 2 conflicts, and since the hardening density difference in a thickness direction serves as size, it leads to a resolving power fall, so that it is made the presentation which an exposure portion hardens more. Moreover, since it will become difficult [use of the powerful developer of solvent power] if the crosslinking density difference of an exposure part / unexposed part and the hardening density of an exposure part cannot be equalized, it becomes difficult [improvement of development nature]. As the photosensitive constituent for black-matrix formation known conventionally, Avoid such a situation, for example, the conventional metal black matrix and the resin black matrix which can carry out comparable protection from light are not formed in JP,6-51499,A and JP,6-3518,A like a description. The optical penetration was carried out to some extent, sensitization capability was given, and protection-from-light capability was not remarkably low practical. For this reason, film contraction in a cure process once forming high thickness and the resin black matrix of a low light sheilding like JP,8-44050,A, Although the resin black matrix which had the degree of high protection from light by the thin film, and the proposal are made, there is a problem of adhesion falling by strain accumulation at the time of that a process becomes complicated and film contraction, and utilization is difficult. Thus, realization of a practical resin black matrix was difficult because of a technical problem which is called protection from light and which carries out glimpse inconsistency that a light response is originally caused under the condition which disagrees with a light response.

[0013]

[Problem(s) to be Solved by the Invention] This invention can form easily the pattern which solves an above-mentioned problem and has a thin film and a high light sheilding by the photo lithography method. The charge of a resist material with sufficient sensitivity, definition, development nature, and endurance is offered, and manufacture of the resin black matrix of a light filter is enabled by high precision and low cost. Moreover, high-definition-izing of a light filter and pollution-free-ization are achieved by resinifying a black matrix.

[0014]

[Means for Solving the Problem] As a result of advancing research wholeheartedly, this invention persons find out that the purpose which requires the photopolymerization constituent containing the novolak epoxy acrylate which has a carboxyl group as binder resin can be solved, and came to complete invention. Namely, the novolak epoxy acrylate in which the summary of this invention has (a) black color material and the (b) carboxyl group, (c) Consist in the photopolymerization nature constituent for light filters characterized by containing the compound which has a photopolymerization initiator and one or more (d) ethylene nature unsaturation machines, and the light filter using it.

[0015]

[Embodiment of the Invention] The black color material of this invention has independent or the independently usable black color material of a black color material according to mixing of use or red, green, blue, etc. at plurality. Moreover, these color materials can be suitably chosen from an inorganic or organic pigment and a color. mixing -- as the example of an usable color material -- Victoria pure blue (42595) -- Auramine O (41000), KACHIRON brilliant flavin (basics 13), Low DAMIN 6GCP (45160), Rhodamine B (45170), Safranine O.K. 70:100 (50240), ERIOGURAUSHIN X (42080), No.120/RIO Nord yellow (21090), the RIO Nord yellow GRO (21090), Simla first yellow 8GF (21105), benzidine yellow 4T-564D (21095), The Simla farce tread 4015 (12355), Rio Knoll Red seven B4401 (15850), First gene blue TGR-L (74160), the RIO Nord blue SM (26150), The RIO Nord blue ES (pigment blue 15:6), the RIONO gene red GD (pigment red 168), RIO Nord Green 2YS (pigment Green 36), etc. are mentioned (the number in () of still the above means a Color Index (C. I.)).

[0016] furthermore, other mixing -- if a C.I. number shows an usable pigment For example C. I. yellow pigment 20, 24, 86, 93, 109, 110, 117, 125, 137, 138, 147, 148,153,154,166, the C.I. ORENJI pigment 36, 43, 51, 55, 59, 61, the C.I. red pigment 9, 97, 122, 123, 149, 168, 177, 180, 192, 215, 216, 217, 220, 223, 224, 226,227,228,240, the C.I. violet pigment 19, 23, 29, 30, 37, 40, 50, the C.I. blue pigment 15, 15:1, 15: 4, 22, 60, 64, the C.I. green pigment 7, the C.I. Brown pigment 23, 25, and 26 grades can be mentioned.

[0017] Moreover, as a black color material in which single use is possible, carbon black, acetylene black, lamp black, bone black, graphite, iron black, aniline black, cyanine black,

titanium black, etc. are mentioned. In these, especially carbon black is desirable from a viewpoint of a protection-from-light rate and picture characteristics. The following carbon black is mentioned as an example of carbon black.

[0018] Mitsubishi Chemical make : MA7, MA8, MA11, MA100, MA220, MA230, #52, #50, #47, #45, #2700, #2650, #2200, #1000, #990, #900 Degussa AG make : Printex95, the purine tex 90, Printex85, Printex75, Printex55, Printex45, Printex40, Printex30, Printex3, PrintexA, PrintexG, SpecialBlack550, SpecialBlack350, SpecialBlack250, SpecialBlack100 [0019] Cabot Corp. make : Monarch460, Monarch430, Monarch280, Monarch120, Monarch800, Monarch4630, REGAL99, REGAL 99R, REGAL415, REGAL 415R, REGAL250, REGAL 250R, REGAL330 and BLACK PEARLS480 and PEARLS130 Colon Vien Carbon company make : RAVEN11, RAVEN15, RAVEN30, RAVEN35, RAVEN40, RAVEN410, RAVEN420, RAVEN450, RAVEN500, RAVEN780, RAVEN850, RAVEN 890H, You may use together with other black or colored inorganic matter, and an organic pigment the above-mentioned carbon black which is RAVEN1000, RAVEN1020, and RAVEN1040. As for other pigments, since a light sheilding or picture characteristics are lower than carbon black, a mixed ratio is restricted naturally.

[0020] the novolak epoxy epoxyacrylate resin which has a carboxyl group is resin which is made to add unsaturation monocarboxylic acid to a novolak epoxy resin, and is further obtained by making a polybasic acid anhydride react in this invention. The novolak epoxy resin can use conveniently a cresol (o, m, p-) novolak epoxy resin, a phenol novolak epoxy resin, a naphthol denaturation novolak epoxy resin, a halogenation phenol novolak epoxy resin, etc. The range of desirable molecular weight is 300-100000 in the weight average molecular weight measured by GPC. A problem is produced in film-forming in many cases as molecular weight is under the above-mentioned range, and by resin beyond the above-mentioned range, there is a possibility that manufacture of gelling may become being easy to happen at the time of an unsaturation monocarboxylic acid addition reaction difficult, conversely.

[0021] As unsaturation monocarboxylic acid, itaconic acid, crotonic acid, cinnamic acid, acrylic acid, Methacrylic acid and methacrylic acid 2-SAKUSHI slag yloxy ethyl, methacrylic acid 2-MAREI slag yloxy ethyl, methacrylic acid 2-phtalo yloxy ethyl, methacrylic acid 2-hexahydro phtalo yloxy ethyl, etc. can be mentioned. Especially in these, since acrylic acid is rich in reactivity, it is desirable.

[0022] The addition reaction to the novolak epoxy resin of unsaturation monocarboxylic acid can use a well-known technique, for example, can be made to react under esterification catalyst existence at the temperature which is 50-150 degrees C. As an esterification catalyst, triethylamine, trimethylamine, benzyl dimethylamine, Quarternary ammonium salt, such as tertiary amine, such as benzyl diethylamine, tetramethyl ammoniumchloride, tetraethyl ammoniumchloride, and dodecyl trimethylammonium chloride, etc. can be used.

[0023] The range of 0.5-1.2Eq is desirable still more desirable to 1Eq of epoxy groups of a novolak epoxy resin, and the range of the addition amount of unsaturation monocarboxylic acid is 0.7-1.1Eq. If the addition amount of unsaturation monocarboxylic acid shifts from the above-mentioned range, the tendency for hardening characteristics to get worse will be accepted. As a polybasic acid anhydride made to add to the novolak epoxy resin which unsaturated carboxylic acid added There are maleic anhydride, succinic anhydride, itaconic acid anhydride, phthalic anhydride, an anhydrous tetrahydrophthalic acid, anhydrous hexahydrophthalic acid, pyromellitic dianhydride, trimellitic anhydride, benzophenone tetracarboxylic dianhydride, etc. A well-known technique can be used also about the addition reaction of a polybasic acid anhydride, and it can obtain by carrying out a continuous reaction under the same conditions as the addition reaction of unsaturation monocarboxylic acid. As for the addition amount of a polybasic acid anhydride, it is desirable that resin acid value serves as the range of 10 - 150 mgKOH/g, and further 20 - especially its 140 mgKOH/g are desirable. If it becomes it lacking in alkali development property that resin acid value is below the above-mentioned range and the above-mentioned range is exceeded, the tendency to be inferior to hardening performance will be accepted.

[0024] A photopolymerization initiator is a compound which produces the activity radical which polymerizes an ethylene nature unsaturation double bond by active-light exposure. As such a compound, for example 2-(4-methoxyphenyl)-4, 6-bis(bird chloro methyl)-s-triazine, 2-(4-methoxy naphthyl)-4, 6-bis(bird chloro methyl)-s-triazine, 2-(4-ethoxy naphthyl)-4, 6-bis(bird chloro methyl)-s-triazine, HAROMECHIRU-ized triazine derivatives, such as 2-(4-ethoxycarbonyl naphthyl)-4 and 6-bis(bird chloro methyl)-s-triazine, 2-bird chloro methyl 5-(2'-benzofuril)-1, 3, 4-OKISA diazole, 2-bird chloro methyl 5-[beta-(2'-benzofuril) vinyl]-1, 3, 4-OKISA diazole, 2-bird chloro methyl 5-[beta-(2'-(6" benzofuril) vinyl)]-1, 3, 4-OKISA diazole, HAROMECHIRU-ized OKISA diazole derivatives, such as 2-bird chloro methyl 5-furil 1, 3, and 4-OKISA diazole, 2-(2'-chlorophenyl)-4, 5-diphenyl imidazole dimer, 2-(2'-chlorophenyl)-4, a 5-bis(3'-methoxyphenyl) imidazole dimer, 2-(2'-fluoro phenyl)-4, 5-diphenyl imidazole dimer, 2-(2'-methoxyphenyl)-4, 5-diphenyl imidazole dimer, Imidazole derivatives, such as (4'-methoxyphenyl)-4 and 5-diphenyl imidazole dimer, Benzoin methyl ether, benzoin phenyl ether, benzoin isobutyl ether, Benzoin alkyl ether, such as benzoin iso-propyl ether, 2-methyl anthraquinone, 2-ethyl anthraquinone, 2-t-butyl anthraquinone, Anthraquinone derivatives, such as 1-chloro anthraquinone, a BENZU ánthrone derivative, Benzophenone, Michler's ketone, 2-methyl benzophenone, 3-methyl benzophenone, 4-methyl benzophenone, 2-chloro benzophenone, 4-bromo benzophenone, Benzophenone derivative [, such as 2-carboxy benzophenone,], 2, and 2-dimethoxy 2-phenyl acetophenone, 2 and 2-diethoxy acetophenone, 1-hydroxy cyclohexyl phenyl ketone, alpha-hydroxy 2-methylphenyl propanone, 1-hydroxy 1-methylethyl (p-isopropyl phenyl) ketone, 1-hydroxy 1-(p-dodecyl phenyl) ketone,

2-methyl (4'-(methyl thio) phenyl)-2-morpholino 1-propanone, Acetophenone derivatives, such as 1, 1, and 1-bird chloro methyl (p-buthylphenyl) ketone, A thioxan ton, 2-ethyl thioxan ton, 2-isopropyl thioxan ton, 2-chloro thioxan ton, 2, 4-dimethyl thioxan ton, 2, 4-diethyl thioxan ton, Thioxan ton derivatives, such as 2 and 4-diisopropyl thioxan ton, Benzoate derivatives, such as p-dimethylamino ethyl benzoate and p-diethylamino ethyl benzoate, Acridine derivatives, such as 9-phenyl acridine and 9-(p-methoxyphenyl) acridine, Phenazine derivatives, such as 9 and 10-dimethyl BENZU phenazine, G cyclopentadienyl Ti-G chloride, A G cyclopentadienyl Ti-****- phenyl, G cyclopentadienyl Ti-****- 2, 3, 4, 5, 6-pentafluoro Feni 1-IRU, G cyclopentadienyl Ti-****- 2, 3, 5, 6-tetrafluoro Feni 1-IRU, G cyclopentadienyl Ti-****- 2, 4, 6-trifluoro Feni 1-IRU, G cyclopentadienyl Ti-2, 6-G fluoro Feni 1-IRU, G cyclopentadienyl Ti-2, 4-G fluoro Feni 1-IRU, G methylcyclopentadienyl Ti-****- 2, 3, 4, 5, 6-pentafluoro Feni 1-IRU, G methylcyclopentadienyl Ti-****- 2, 6-G fluoro Feni 1-IRU, G cyclopentadienyl Ti-2, 6-G fluoro 3-(****- 1-IRU)- Titanocene derivatives, such as Feni 1-IRU, etc. are mentioned.

[0025] It is desirable in order that a biimidazole derivative, a titanocene derivative, a triazine derivative, and especially an OKISA diazole derivative may show the performance excellent in sensitivity, definition, development nature, and adhesion in these compounds. It is desirable in order to show the performance in which the biimidazole derivative was excellent also especially in these.

[0026] Sensitizing dye can also be further added to the photopolymerization initiator of this invention in addition to the above-mentioned component. In order to make a photopolymerization reaction cause under high protection from light, it is desirable to add sensitizing dye. As such sensitizing dye, for example, JP,H3-239703,A, The coumarin compound which has the heterocycle of a description in JP,H5-289335,A, The 3-keto coumarin compound indicated to JP,S63-221110,A, A xanthene pigment given in JP,H4-221958,A and JP,H4-219756,A, Pyromethene pigment given in JP,H6-19240,A, JP,S47-2528,A, JP,S54-155292,A, JP,S56-166154,A, Ketone (p-dialkylamino benzylidene) of a description, a styryl system pigment, the sensitizing dye that has the JURORIJIRU machine of a description in Tokuganhei5-83588, the diaminobenzene compound of seven to Japanese-Patent-Application-No. 10109 description, etc. can be mentioned to JP,S59-56403,A.

[0027] Amino group content sensitizing dye is especially desirable in these sensitizing dye, and, more specifically, it is a compound which has an amino group and a phenyl group. If it illustrates concretely, for example 4 and 4'-bis(dimethylamino) benzophenone, 4 and 4'-bis(diethylamino) benzophenone, 2-amino benzophenone, 4-amino benzophenone, 4, and 4'-diamino benzophenone, 3, and 3'-bis(diamino) benzophenone, Benzophenone system compounds, such as 3 and 4-diamino benzophenone, 2-(p-dimethylamino phenyl) benzooxazole, 2-(p-diethylaminophenyl) benzooxazole, 2-(p-dimethylamino phenyl) benzo[4, 5] benzooxazole, 2-(p-dimethylamino phenyl) benzo[6, 7] benzooxazole, 2, the 5-screw (p-

diethylaminophenyl) 1, 3, 4-oxazole, 2-(p-dimethylamino phenyl) benzothiazole, 2-(p-diethylaminophenyl) benzothiazole, 2-(p-dimethylamino phenyl) benzimidazole 2-(p-diethylaminophenyl) benzimidazole 2, the 5-screw (p-diethylaminophenyl) 1, 3, 4-thiadiazole, pyridine (p-dimethylamino phenyl), pyridine (p-diethylaminophenyl), p-dialkyl aminophenyl machine content compounds, such as 2-(p-dimethylamino phenyl) quinoline, 2-(p-diethylaminophenyl) quinoline, 2-(p-dimethylamino phenyl) pyrimidine, and 2-(p-diethylaminophenyl) pyrimidine, etc. can be mentioned.

[0028] Furthermore, it is desirable to add, since a uniform optical hardening reaction can be caused under high protection from light by using polyfunctional thiol for the above-mentioned photopolymerization initiator as a part of start system. [a thiol group / that what is necessary is just the compound which it has two or more pieces] as desirable polyfunctional thiol although it adds For example, hexane dithiol, the Deccan dithiol, 1, 4-dimethyl mercapto benzene, Butanediol screw thioglycolate, ethylene glycol screw thioglycolate, Trimethylol propane tris thioglycolate, pentaerythritol tetrakis thioglycolate, Butanediol screw thiopropionate, ethylene glycol screw thiopropionate, Trimethylol propane tris thiopropionate, pentaerythritol tetrakis thiopropionate, trimercapto propionic acid tris (2-hydroxyethyl) isocyanurate, etc. are mentioned. ** et al. -- ** -- two or more sets are seen and polyfunctional thiol can be used [one sort or]

dithio

[0029] As a compound (henceforth an ethylene nature compound) which has one or more ethylene nature unsaturation machines Ester of an aliphatic series (Pori) hydroxy compound and unsaturated carboxylic acid, Ester of an aromatic series polyhydroxy compound and unsaturated carboxylic acid, the ester obtained with unsaturated carboxylic acid, multivalent carboxylic acid, and an aliphatic series polyhydroxy compound, Ethylene oxide of an aromatic series polyhydroxy compound, the esterification reaction of a propylene oxide addition product and unsaturated carboxylic acid, Ethylene oxide of an aliphatic series polyhydroxy compound, the esterification reaction of a propylene oxide addition product and unsaturated carboxylic acid, Ester of a caprolactone denaturation polyhydric alcohol and unsaturated carboxylic acid, the reactant of a polyhydric alcohol, multivalent isocyanate, and unsaturated carboxylic acid, a styryl end compound, a phosphorus-containing acid unsaturated compound, the addition product of Pori epoxy and unsaturated carboxylic acid, etc. are mentioned.

[0030] As ester of an aliphatic series polyhydroxy compound and unsaturated carboxylic acid, among these specifically Ethylene glycol diacrylate, triethylene glycol diacrylate, Neopentyl glycol diacrylate, hexanediol diacrylate, Trimethylolpropane triacrylate, trimethylol triacrylate, Pentaerythritol diacrylate, pentaerythritol bird acrylate, Pentaerythritol tetraacrylate, dipentaerythritol tetraacrylate, Dipentaerythritol pentaacrylate, dipentaerythritol hexaacrylate, Acrylic ester, such as glycerol acrylate, the methacrylic ester which replaced the acrylate of these illustration compound with methacrylate, The maleate replaced with the itaconic acid

ester similarly replaced with itaconate, the crotonic acid ester replaced with crotonate, or maleate is mentioned.

[0031] As ester of an aromatic series polyhydroxy compound and unsaturated carboxylic acid, hydroquinone diacrylate, hydroquinone dimethacrylate, resorcinol diacrylate, resorcinol dimethacrylate, pyrogallol bird acrylate, etc. are mentioned. Although there is nothing, as ester obtained by an esterification reaction with unsaturated carboxylic acid, multivalent carboxylic acid, and a multivalent hydroxy compound, by a single thing not necessarily as a typical example The condensate of the condensate of acrylic acid, phthalic acid and the condensate of ethylene glycol, acrylic acid, maleic acid and the condensate of diethylene glycol, methacrylic acid, terephthalic acid, and pentaerythritol, acrylic acid, adipic acid, butanediol, and glycerol etc. is mentioned.

[0032] In addition, as an example of the ethylene nature compound used for this invention, vinyl group content compounds, such as allyl ester; divinyl phthalate, such as acrylamide; diallyl phthalates, such as ethylene screw acrylamide, etc. are useful.

[0033] The most desirable thing in the ethylene nature compound mentioned above is a thing which two or more ethylene nature unsaturation machines [three or more] have still more preferably in the same intramolecular and which it has. Moreover, they are an acrylic group (meta) and the thing which has an acrylic group still more preferably preferably as an unsaturation machine. As such a compound, trimethylolpropane triacrylate, Trimethylol triacrylate, pentaerythritol diacrylate, Pentaerythritol bird acrylate, pentaerythritol tetraacrylate, dipentaerythritol tetraacrylate, dipentaerythritol pentaacrylate, dipentaerythritol hexaacrylate, etc. are mentioned.

[0034] A photopolymerization initiator to the novolak epoxy-epoxyacrylate-resin 100 weight part in which the desirable loadings of the quoted this invention constituent have a carboxyl group As mentioned above, 0.1 - 50 weight part, desirable -- 1 - 45 weight part and an ethylene nature compound -- a 10 - 200 weight part -- it is a 20 - 180 weight part preferably. moreover, 35 in total solids excluding [the black color material] solvent - 70wt% -- it is 40 to 65% of range more preferably.

[0035] If it becomes that a photopolymerization initiator is under the above-mentioned range with low sensitivity, and is inferior in respect of working efficiency and the above-mentioned range is exceeded, it will be easy to have a bad influence on a paint film formation function. When it will be easy to come to the endurance due to a crosslinking density fall, a heat-resisting property, etc. out of a problem if an ethylene nature compound is under the above, and the above-mentioned range is exceeded, the problem to which development nature falls may occur. Since a light sheilding falls that a black color material is under the above-mentioned range, it becomes difficult to form the resin black matrix of sufficient optical density. On the contrary, since the fall of sensitivity, definition, development nature, etc. will become

intense if the above-mentioned range is exceeded, image formation becomes difficult.

[0036] When carrying out the loadings of the polyfunctional thiol, it is desirable to add in 0.03 to 5weight % of the range still more preferably 0.02 to 7weight % more preferably 0.01 to 10weight % to total solids excluding the solvent from using as a component of a photopolymerization initiator system. If the rate of a compounding ratio shifts from the above-mentioned range, the stability of a sensitizing solution, an odor, sensitivity, definition, development nature, adhesion, etc. will come to get worse. Sensitivity and adhesion fall in the amount of low addition, and stability, an odor, definition, and development nature fall in the amount of high addition.

[0037] The constituent of this invention is used where the compound which usually has (a) black color material, the novolak (epoxy acrylate c) photopolymerization initiator which has the (b) carboxyl group, and one or more (d) ethylene nature unsaturation machines is melted to a solvent. Although there is no restriction in particular as a solvent, for example Diisopropyl ether, A mineral spirit, n pentane, amyl ether, an ethyl KAPURI rate, N-hexane, diethylether, isoprene, ethyl isobutyl ether, Butyl stearate, n-octane, BARUSORU #2, an Apco #18 solvent, Diisobutylene, amyl acetate, butyl butyrate, an Apco thinner, Butyl ether, diisobutyl ketone, methyl cyclohexene, methyl nonyl ketone, Propyl ether, dodecane, Socal solvent No.1 and No.2, amyl formate, dihexyl ether, diisopropyl ketone, Solvesso #150, and butyl acetate (n --) sec, t, hexene, shell TS28 A solvent, butyl chloride, Octanone 3, ethyl benzonate, amyl chloride, ethylene glycol diethylether, Ethyl orthochromatic formate, methoxymethyl pentanone, methyl butyl ketone, methyl hexyl ketone, methyl iso butyrate, benzonitrile, ethyl propionate, methyl-cellosolve acetate, methyl isoamyl ketone, methyl isobutyl ketone, Propyl acetate, amyl acetate, amyl formate, bicyclo hexyl, Diethylene-glycol-monoethyl-ether acetate, dipentene, Methoxymethyl pentanol, methyl amyl ketone, methyl isopropyl ketone, Propyl propionate, propylene glycol t-butyl ether, Methyl ethyl ketone, methyl cellosolve, ethylcellosolve, ethylcellosolve acetate, Carbitol, cyclohexanone, ethyl acetate, propylene glycol, Propylene glycol monomethyl ether, propylene-glycol-monomethyl-ether acetate, Propylene glycol monoethyl ether, propylene glycol monoethyl ether acetate, Dipropylene glycol monoethyl ether, dipropylene glycol monomethyl ether, Propylene glycol monoethyl ether acetate, dipropylene glycol monomethyl ether acetate, 3-methoxy propionic acid, 3-ethoxy propionic acid, 3-ethoxy ethyl propionate, 3-methoxy methyl propionate, 3-methoxy ethyl propionate, 3-methoxy propionic acid propyl, 3-methoxy butyl propionate, a jig lime, dipropylene glycol monomethyl ether, Ethylene glycol acetate, ethyl carbitol, butyl carbitol, Organic solvents, such as ethylene glycol monobutyl ether, propylene glycol t-butyl ether, 3-methyl 3-methoxybutanol, tripropylene glycol methyl ether, and 3-methyl 3-methoxy butyl acetate, can be mentioned concretely.

[0038] As for a solvent, it is desirable that can dissolve or distribute each component and a

boiling point chooses the thing of the range which is 100-200 degrees C. It has a 120-170-degree C boiling point more preferably. these solvents are independent -- or it can be mixed and used. As for the photopolymerization nature constituent of this invention, it is desirable for solid content concentration to prepare preferably, five to 50weight %, using these solvents, so that it may become 10 to 30weight % of a range.

[0039] In this invention, a pigment agent, an adhesion improver, a spreading disposition top agent, a development improvement agent, etc. can be suitably added in addition to these essential ingredients. It is desirable for distributing a black color material minutely in this constituent, and stabilizing the distributed state especially, to blend a pigment agent on quality stability, since it is important.

[0040] Although a pigment agent has compatibility in both a pigment and binder resin and surface active agents, such as Nonion, a cation, and an anion, a polymer dispersant, etc. are mentioned Especially, a polymer dispersant is desirable and the polymer dispersant which has basic functional groups, such as nitrogen-containing heterocycles, such as the first class, the second class or the third class amino group, pyridine, pyrimidine, and pyrazine, especially is used advantageously.

[0041] If a chemical constitution desirable as a polymer dispersant is illustrated concretely For example, a polyisocyanate compound, The dispersion resin with which it is obtained by reacting the compound which has a hydroxyl group in intramolecular and has active hydrogen and the 3rd class amino group in one piece or the compound of the number average molecular weight 300-10,000 which it has two pieces, and the same intramolecular (weight average molecular weight 1,000-200,000) is mentioned.

[0042] As an example of the above-mentioned polyisocyanate compound, the Para Feni range isocyanate, 2, 4-tolylene diisocyanate, 2, 6-tolylene diisocyanate, 4 and 4'-diphenylmethane diisocyanate, naphthalene 1, 5-diisocyanate, Aromatic series diisocyanate, such as tolidine diisocyanate, hexamethylene di-isocyanate, Lysinemethylester diisocyanate, 2, 4, and 4-trimethyl hexamethylene di-isocyanate, Aliphatic series diisocyanate, such as dimer acid diisocyanate, isophorone diisocyanate, Alicycle group diisocyanate, such as 4 and 4'-methylene screw (cyclohexyl isocyanate), omega, and omega'-JIISOSHINETO dimethylcyclohexane, The aliphatic series diisocyanate which has rings, such as xylylene diisocyanate, alpha, alpha, alpha', and alpha'-tetramethyl xylylene diisocyanate, Lysine ester tri-isocyanate, 1,6,11-undecane-tri-iso-isocyanate, 1, 8-diisocyanate 4-isocyanate methyl octane, 1, 3, 6-hexamethylene tri-isocyanate, bicyclo heptane tri-isocyanate, tris (isocyanate phenyl methane) Tri-isocyanate and these trimers, water addition products, these polyol addition products, etc., such as tris (isocyanate phenyl) thio phosphate, are mentioned. The trimer of organic diisocyanate is desirable as a polyisocyanate, and the trimer of tolylene diisocyanate and the trimer of isophorone diisocyanate are the most desirable, and it may use

these independently or may use them together.

[0043] As the manufacture method of the trimer of isocyanate Said polyisocyanates A suitable 3 quantification catalyst, for example, tertiary amine, 3 partial quantification of an isocyanate group is performed using phosphine, alkoxide, a metal oxide, and carboxylate. After stopping 3 quantification by addition of a catalyst poison, the method of solvent extraction and thin film distillation removing an unreacted polyisocyanate, and obtaining the target isocyanurate machine content polyisocyanate is mentioned.

[0044] As a compound of one piece or the number average molecular weight 300-10,000 which it has two pieces, a hydroxyl group to the same intramolecular Polyether glycol, The thing by which alkoxy ** of the ***** hydroxyl group of these compounds was carried out by the alkyl group of the carbon number 1-25 and these two or more kinds of mixtures, such as a polyester glycol, a polycarbonate glycol, and a polyolefine glycol, are mentioned.

[0045] As polyether glycol, polyether diol, polyether ester diol, and these two or more kinds of mixtures are mentioned. As polyether diol, alkylene oxide Independent or the thing obtained by making carry out copolymerization, For example, polyethylene glycol, polypropylene glycol, polyethylene propylene glycol, polyoxy tetramethylene glycol, polyoxy hexamethylene glycol, polyoxy octamethylene glycols, and two or more sorts of those mixtures are mentioned. As polyether ester diol, a mixture with ether group content diol or other glycols with dicarboxylic acid or [make / it / to react with those anhydride] Or what is obtained by making alkylene oxide react to a polyester glycol, for example, Pori (polyoxy tetramethylen) Aji Pate etc., is mentioned. The compound with which alkoxy ** of polyethylene glycol, polypropylene glycol, polyoxy tetramethylene glycol, or the ***** hydroxyl group of these compounds was carried out by the alkyl group of the carbon number 1-25 is the most desirable as polyether glycol.

[0046] as a polyester glycol -- dicarboxylic acid (succinic acid and glutaric acid --) those anhydride, such as adipic acid, sebacic acid, fumaric acid, maleic acid, and phthalic acid, and a glycol (ethylene glycol --) Diethylene glycol, triethylene glycol, propylene glycol, Dipropylene glycol, tripropylene glycol, 1, 2-butanediol, 1, 3-butanediol, 1, 4-butanediol, 2, 3-butanediol, 3-methyl 1,5-pentanediol, neopentyl glycol, The 2-methyl 1, 3-propanediol, the 2-methyl 2-propyl 1, 3-propanediol, 2-butyl 2-ethyl 1, 3-propane JIORU, 1,5-pentanediol, 1, 6-hexandiol, the 2-methyl 2, 4-pentanediol, 2, 2, 4-bird methyl 1, 3-pentanediol, 2-ethyl 1, 3-hexandiol, Alicycle group glycols, such as aliphatic series glycols, such as 2, 5-dimethyl 2, 5-hexandiol, 1, 8-octamethylene glycol, 2-methyl 1, 8-octamethylene glycol, 1, and 9-nonane diol, and screw hydroxymethyl cyclohexane, Aromatic series glycols, such as a KISHIRIREN glycol and screw hydroxy ethoxy benzene, What was obtained by having made carry out the polycondensation of the N-alkyl dialkanolamine, such as N-methyldiethanolamine, etc., For example, polyethylene horse mackerel PETO, a polubutylene adipate, polyhexamethylene horse mackerel PETO, The Pori lactone diol or the Pori lactone mono-oar obtained using the

monohydric alcohol of said diols, such as polyethylene / propylene horse mackerel PETO, or a carbon number 1-25 as an initiator, For example, a Pori caprolactone glycol, Pori methyl valerolactone, and two or more sorts of these mixtures are mentioned. The Pori caprolactone which used the Pori caprolactone glycol or the alcohol of the carbon number 1-25 as the initiator is the most desirable as a polyester glycol.

[0047] As a polycarbonate glycol, Pori (1, 6-hexylene) carbonate, As polyolefine glycols, such as Pori (3-methyl 1, 5-pentylene) carbonate, a polybutadiene glycol, a hydrogenation type polybutadiene glycol, a hydrogenation type polyisoprene glycol, etc. are mentioned. the same intramolecular -- a hydroxyl group -- one piece or the number average molecular weight of a compound which it has two pieces -- 300-10,000 -- desirable -- 500-6,000 -- it is 1,000-4,000 still more preferably.

[0048] Active hydrogen and the compound which has the 3rd class amino group are explained to the same intramolecular used for this invention. As a hydrogen atom coupled directly with active hydrogen, i.e., an oxygen atom, the nitrogen atom, or the sulfur atom, the hydrogen atom in functional groups, such as a hydroxyl group, an amino group, and a thiol group, is mentioned, and the hydrogen atom of an amino group, especially the amino group of the 1st class is especially desirable. The 3rd class amino group in particular is not limited. moreover, the amino group which has the alkyl group of a carbon number 1-4 as the 3rd class amino group or heterocycle structure -- more specifically, an imidazole ring or a triazole ring is mentioned.

[0049] If active hydrogen and the compound which has the 3rd class amino group are illustrated to such same intramolecular N and N-dimethyl 1,3-propanediamine, N, and N-diethyl 1,3-propanediamine, N and N-dipropyl 1,3-propanediamine, N, and N-dibutyl 1,3-propanediamine, N and N-dimethyl ethylenediamine, N, and N-diethyl ethylenediamine, N and N-dipropyl ethylenediamine, N, and N-dibutyl ethylenediamine, The N and N-dimethyl 1, 4-butanediamine, N, and N-diethyl 1, 4-butanediamine, N, and N-dipropyl 1, 4-butanediamine, N, and N-dibutyl 1, 4-butanediamine, etc. are mentioned.

[0050] The 3rd class amino group as what is N content heterocycle Moreover, a pyrazole ring, An imidazole ring, a triazole ring, a tetrazole ring, the Indore ring, A carbazole ring, an indazole ring, a BENZU imidazole ring, a benzotriazol ring, N content hetero 6 membered-rings, such as N content hetero 5 membered-rings, such as a benzooxazole ring, a benzothiazole ring, and a benzothiadiazole ring, a pyridine ring, a pyridazine ring, a pyrimidine ring, a triazine ring, a quinoline ring, an acridine ring, and an isoquinoline ring, are mentioned. A thing desirable as such N content heterocycles is an imidazole ring or a triazole ring.

[0051] These imidazole rings and NH₂ If the compound which has a machine is illustrated concretely, 1-(3-aminopropyl) imidazole, histidine, 2-amino imidazole, 1-(2-aminoethyl) imidazole, etc. will be mentioned. Moreover, a triazole ring and NH₂ if the compound which

has a machine is illustrated concretely The 3-amino 1, 2, 4-triazole, 5-(2-amino 5-chlorophenyl)-3-phenyl 1H-1, 2, 4-triazole, 4-amino 4H-1, 2, 4-triazole 3, 5-diol, 3-amino 5-phenyl 1H-1, 3, 4-triazole, 5-amino 1, 4-diphenyl 1, 2, 3-triazole, 3-amino 1-benzyl 1H-2, and 4-triazole etc. is mentioned.

[0052] N and N-dimethyl 1,3-propanediamine, N, and N-diethyl 1,3-propanediamine, 1-(3-aminopropyl) imidazole, 3-amino 1, 2, and 4-triazole is desirable especially. The desirable rate of a compounding ratio of a dispersant raw material receives a polyisocyanate compound 100 weight part. One piece or the compound of the number average molecular weight 300-10,000 which it has two hydroxyl groups to the same intramolecular A 10 - 200 weight part, desirable - a 20 - 190 weight part and the compound which has active hydrogen and the 3rd class amino group in a 30 - 180 weight part and the same intramolecular still more preferably -- 0.2 - 25 weight part -- it is 0.3 - 24 weight part preferably.

[0053] the GPC equivalent weight average molecular weight of dispersion resin -- 1,000-200,000 -- desirable -- 2,000-100,000 -- it is the range of 3,000-50,000 more preferably. In 1,000 or less molecular weight, dispersibility and a dispersion stability are inferior, and while solubility falls and dispersibility is inferior, control of a reaction becomes difficult 200,000 or more. Manufacture of dispersion resin of this invention is performed according to the well-known method of polyurethane resin manufacture. As a solvent at the time of manufacturing, usually Acetone, methyl ethyl ketone, Ketone, such as methyl isobutyl ketone, cyclopentanone, cyclohexanone, and an isophorone, Ester species, such as ethyl acetate, butyl acetate, and acetic acid cellosolve, benzene, Hydrocarbons, such as toluene, xylene, and hexane, diacetone alcohol, Some [, such as isopropanol the second butanol, and the third butanol,] alcohols, Aprotic polar solvents, such as ether, such as chlorides, such as a methylene chloride and chloroform, tetrahydrofuran, and diethylether, dimethylformamide, N-methyl pyrrolidone, and dimethylsulfoxide, etc. are used.

[0054] The usual urethane-ized reaction catalyst is used as a catalyst at the time of manufacturing. For example, tertiary amine systems, such as iron systems, such as tin systems, such as dibutyltin dilaurate, dioctyl CHINJI laurate, Djibouti rutin dioctoate, and stannous octoate, iron acetylacetonato, and ferric chloride, triethylamine, and a triethylene diamine, etc. are mentioned.

[0055] As for the introduction amount of the compound which has active hydrogen and the 3rd class amino group in the same intramolecular, it is desirable to control by amine value after a reaction in the range of 1 - 100 mgKOH/g. It is the range of 5 - 95 mgKOH/g more preferably. amine value carrying out neutralization titration of the basic amino group with an acid, and making it correspond to an acid number -- mg of KOH -- it is the value expressed with the number. If there is a tendency for dispersive power power to decline that amine value is below the above-mentioned range and the above-mentioned range is exceeded, development nature

will fall easily. In addition, since the stability of dispersion resin with the passage of time will become high further if an isocyanate group is crushed with an alcohol or an amino compound when an isocyanate group remains in dispersion resin at the above reaction, it is desirable. In addition, when using a pigment agent, as for the using rate, 0.1 to 30 weight % is desirable to a pigment, and its 0.5 to 25 weight % is especially desirable.

[0056] Next, the manufacture method of the photopolymerization nature constituent for light filters of this invention is explained. As for a black color material, in this invention, it is usually desirable to carry out distributed processing using a paint conditioner, a Sand grinder, a ball mill, a roll mill, a stone mill, a jet mill, a homogenizer, etc. beforehand. Since a black color material is atomized by distributed processing, the protection-from-light ability improvement of resist and improvement in spreading characteristics are attained.

[0057] It is desirable to process the binder resin which has a black color material, a solvent, or a distributed function in distributed processing, or the above mentioned pigment agent by the system further used together. Since it will pass if especially a polymer dispersant is used, and it excels in the dispersion stability at the time, it is desirable. Moreover, the distributed processing in the liquid which mixed all the components blended as resist liquid has a possibility that the component of the high reactivity for generation of heat produced at the time of dispersion may denaturalize.

[0058] When making a Sand grinder distribute, the glass bead or zirconia beads of the diameter of 0.1 to several millimeters is used preferably. Temperature is 0 degree C to 100 degrees C, and the range of the conditions to distribute is usually 80 degrees C from a room temperature preferably. Since proper time changes with the presentation (a black color material, a solvent, dispersant) of ink, device sizes of a Sand grinder, etc., distributed time is adjusted suitably. The standard of dispersion controls the gloss of ink so that the 20-degree gloss value of resist serves as the range of 100-200. When resist gloss is low, pigment grains that distributed processing is not enough and rude remain in many cases, and are inadequate in respect of development nature, adhesion, definition, etc. Moreover, since many ultrafine particles will arise if the distributed processing of the gloss value is carried out until it exceeds the above-mentioned range, a dispersion stability will be on the contrary easy to be spoiled.

[0059] Next, other above-mentioned components required as a resist component are added, and it mixes with the black ink obtained by the above-mentioned distributed processing, and is considered as a uniform solution. In order that detailed garbage may mix with a sensitizing solution in a manufacturing process in many cases, as for the obtained resist sensitizing solution, it is desirable to carry out filtration treatment with a filter etc. Then, the manufacture method of the light filter using the photopolymerization nature constituent for light filters of this invention is explained.

[0060] First, after applying the photopolymerization nature constituent for light-shielding films of

this invention on a transparent base with coaters, such as a spinner, a wire bar, a flow coater, die KOTA, a roll coater, and a spray, and drying, Place a photomask on this sample and the black matrix picture for protection from light is made to form by heat curing or optical hardening image exposure, development, and if needed through this photomask, this operation is further repeated respectively about RGB3 color, and a light filter picture is made to form.

[0061] In addition, since it is very high sensitivity and high resolving power when forming the pixel of a light filter using the photopolymerization nature constituent of this invention, it is possible to expose and develop negatives and to form a picture, without preparing oxygen interception layers, such as polyvinyl alcohol. Although the transparent base used here is a transparent base for light filters and the quality of the material in particular is not limited For example, polyester and polypropylene, such as polyethylene terephthalate, Polycarbonate, such as polyolefines, such as polyethylene, polymethylmethacrylate, Thermosetting plastic sheets, such as a thermoplastic plastic sheet of polysulfone, an epoxy resin, polyester resin, and a poly(meta) acrylate resin, or various glass plates can be mentioned. A glass plate and heat-resistant plastics are preferably used in particular from a heat-resistant point.

[0062] In order to improve physical properties, such as a surface adhesive property, thin film treatment of various polymer, such as corona discharge treatment, ozonization, a silane coupling agent, and urethane polymer, etc. can also be beforehand performed in such a transparent base. Although the spreading method in particular is not limited, it is good for the thickness of the resin black matrix after spreading and desiccation to make preferably 0.1-1.5micro 0.1-2micro still more preferably the range of 0.1-1micro. in addition, as for the light filter of this invention, it is desirable from a point of a light sheilding that an optical density is 3.0 or more in 1micro of thickness. Moreover, it is advantageous as an index of distributed states for solid, such as a pigment, that the 20-degree gloss value of a black matrix is 100-200.

[0063] Being able to use a hot plate, IR oven, a convection oven, etc. in desiccation, desirable desiccation conditions are 40-150 degrees C, and drying time is a range for 10 seconds - 60 minutes. The light source used for exposure, for example Moreover, a xenon lamp, a halogen lamp, Laser light sources, such as a lamp light source of a tungsten lamp, a high pressure mercury vapor lamp, an ultrahigh pressure mercury lamp, a halide lamp, an inside pressure mercury-vapor lamp, a low pressure mercury lamp, etc., argon ion laser, an YAG laser, an excimer laser, and nitrogen laser, etc. are mentioned. A light filter can also be used when using only the wavelength of specific light irradiating.

[0064] If a development is a solvent with the capability to dissolve the resist layer of an unexposed part, restriction in particular will not be received. For example, organic solvents, such as acetone, a methylene chloride, trichlene, and cyclohexanone, can be used. However, since an organic solvent has many things with environmental pollution, the hazardous property over a human body, fire hazard nature, etc., its using-alkaline development liquid without such

danger direction is desirable. As such alkaline development liquid, for example Sodium carbonate, potassium carbonate, The aqueous solution containing organic alkali chemicals, such as inorganic alkali chemicals, such as a specific silicate, a potassium silicate, sodium hydroxide, and potassium hydroxide, or diethanolamine, triethanolamine, and a tetraalkylammonium hydroxide salt, is mentioned. Alkaline development liquid can also be made to contain the low-molecular compound which has a surface active agent, a water-soluble organic solvent, a hydroxyl group, or a carboxylic acid group if needed. It is desirable especially to add, since a surface active agent has many which have the improvement effect to development nature, definition, greasing, etc.

[0065] As a surface active agent for developers, for example, a sodium naphthalenesulfonate machine, The anionic surface active agent which has a benzenesulfonic acid sodium group, the nonionic surface active agent which has a polyalkylene oxy-group, the cationic surface active agent which has a tetra-alkylammonium machine, etc. can be mentioned. Although there is no restriction in particular about the development method, it is 15-45 degrees C in development temperature preferably, and 10-50 degrees C is usually performed by methods, such as immersion development, spray development, brush development, and ultrasonic development.

[0066]

[Example] Although an example and a comparative example are given below and this invention is explained still in detail, this invention is not limited to the following examples, unless the summary is exceeded.

[0067] Synthetic example-1 (preparation of a dispersion resin solution)

As 32g of trimers (MITEC [, Mitsubishi Chemical,] GP 750A, resin solid content 50wt%, and butyl acetate solution) and the catalyst of tolylene diisocyanate The dilution dissolution of the dibutyltin dilaurate 0.02g was carried out by PGMEA (propylene-glycol-monomethyl-ether acetate) 47g. polyethylene glycol (the Nippon Oil & Fats Co., Ltd. make --) of the number average molecular weight 1,000 from which ***** is this with the methoxy group under churning uni--- the mixture of OKKUSU M-1000 14.4g and the polypropylene glycol (the Sanyo Chemical Industries, Ltd. make, San Knicks PP-1000) 9.6g of the number average molecular weight 1,000 After being dropped, it was made to react at 70 degrees C for further 3 hours. Next, N and N-dimethylamino 1,3-propanediamine 1g was added, and it was made to react at 40 degrees C for further 1 hour. Thus, it was 14 mgKOH/g when asked for the amine value of the solution containing the obtained dispersion resin with neutralization titration. Moreover, the resin content was 40wt% when the resin content was calculated by the dry rising method (it removes for 30 minutes at 150 degrees C, a solvent is removed on a hot plate, and resin concentration is computed by weight variation).

[0068] Synthetic example-2 weight-per-epoxy-equivalent 200 g/eq, 200g of o-cresol novolak

epoxy resins of 65 degrees C of softening temperatures, 72g of acrylic acid, p-methoxy phenol 0.2g, dodecyl trimethylammonium chloride 0.2g, and propylene-glycol-monomethyl-ether acetate 272g It taught the flask and was made to react at the temperature of 100 degrees C for 8 hours (1Eq of acrylic acid reacts to 1Eq of epoxy groups). Furthermore, 42g of tetrahydro phthalic anhydride was added, and it was made to react at 80 degrees C for 3 hours.

Reprecipitation and the novolak epoxy epoxyacrylate resin which is made to carry out suction drying and has a carboxyl group were obtained for this reaction liquid in water. When neutralization titration by KOH was performed, the acid numbers of resin were 50 mgKOH/g.

[0069] It reacted like synthetic example-2 except the amount of addition of synthetic example-3 tetrahydro phthalic anhydride having been 63g. The obtained resin acid value was 70 mgKOH/g.

It reacted like synthetic example-2 except the amount of addition of synthetic example-4 tetrahydro phthalic anhydride having been 101g. The obtained resin acid value was 100 mgKOH/g.

[0070] (Dispersion of carbon black) By making into solid content a carbon black MA-220 (made by Mitsubishi Chemical) 50 weight part, and the dispersion resin shown in synthetic example-1, it is the rate of 5 weight parts, and carbon black, a dispersion resin solution, and PGMEA were added so that solid content concentration might become 50wt%. The weight of dispersion liquid was 50g. This was well agitated by the agitator and pre mixing was performed. Next, the paint shaker performed distributed processing in 25-45 degrees C for 6 hours. The bead applied the same weight as dispersion liquid using the zirconia beads of 0.5mmphi. The filter separated a bead and dispersion liquid after termination of distributed.

[0071] Added each component, it was made to agitate and dissolve with a stirrer so that it may become the following blending ratio of coal as solid content using the carbon black dispersion ink in which an example 1-3 and comparative example 1 resist liquid carried out preparation ****, and the black resist sensitizing solution was adjusted.

1) The presentation of resist [0072]

[Table 1]

Pigment Carbon black MA-220 (made by Mitsubishi Chemical) 50g 25g of binder resin (Table - it indicates to 1) Acrylic monomer; dipentaerythritol hexaacrylate 15g Photopolymerization initiator 2g of -2-(2'-chlorophenyl)-4 and 5-diphenyl imidazole dimers - 4 and 4'-bis (diethylamino) benzophenone 1g - pentaerythritol tetrakis thiopropionate 1g Solvent Propylene-glycol-monomethyl-ether acetate 300g Polymer dispersant (synthetic example-1) 5g Surface active agent FC-430 (made by Sumitomo 3 M company) 100 ppm [0073] 2) The evaluation black resist sensitizing solution of resist was applied to the glass substrate (7059, Corning, Inc. make) in the spin coater, and 80 degrees C dried for 1 minute with the hot plate. It was 1micro when the thickness of the resist after desiccation was measured by the sending

pin type thickness gage (alpha-step, ten call company make). Next, through the mask, with the high pressure mercury vapor lamp, the light exposure was changed and image exposure of this sample was carried out. Immersion development was carried out for 1 minute at the potassium hydroxide solution of the temperature of 25 degrees C, and 0.05% of concentration, and the resist pattern was obtained.

[0074] 1. The mask pattern with a sensitivity of 20micro was made into sensitivity with the light exposure (proper light exposure) which can be formed as a size. That is, it is shown that the resist with few light exposures is quantity sensitivity in a low light exposure since image formation is possible.

[0075] 2. Microscope observation of the resolvable resist minimum pattern dimension in the light exposure which reproduces faithfully the mask pattern of 20micro of resolving power was carried out by one 200 times the magnification of this. That in which the minimum pattern dimension exceeds resolving power O and 10micro for 10micro or less was made into x.

[0076] 3. It is the Macbeth reflection density meter about the optical density (OD) of a light-shielding streak part. It measured by TR927 (made by col MORUGUN). In addition, it is shown that an OD value is a numerical value which shows protection-from-light capability, and it is a high light sheilding, so that a numerical value is large.

[0077] 4. The adhesion Scotch tape examination (a Scotch tape is torn off after sticking a Scotch tape on a resist pattern) estimated adhesion. What O and exfoliation are regarded as in that in which a resist pattern does not exfoliate was made into x.

[0078] 5. The 20-degree gloss value of the black resist surface after desiccation was measured with the gloss value glossimeter (big KEMI). In addition, the black matrix was formed on the glass substrate using the black resist sensitizing solution of an example 1-3, and, subsequently red, green, and the light filter that has the black matrix which was excellent in the light sheilding by forming each blue pixel have been manufactured.

[0079]

[Table 2]

表-1

	バインダー樹脂	感 度	解像力	遮光性	密着性	光沢値
実施例-1	合成例-2	100mj	○	3.5	○	130
実施例-2	合成例-3	100mj	○	3.5	○	130
実施例-3	合成例-4	100mj	○	3.5	○	130
比較例-1	スチレン・アクリル 酸樹脂 (Mw=5000、酸化220)	× *1	×	—	—	130

* 1:20micro image formation is improper. [0080]

[Effect of the Invention] Since the resist constituent for light filters of this invention is excellent in sensitivity, development nature, definition, adhesion, and endurance though it is a high light shielding in a thin film, it can form a quality resin black matrix by low cost. Since the light filter using the resin black matrix of this invention is excellent in precision, flat nature, and endurance, it can raise the labeling grace of a liquid crystal element more than before. Moreover, since a substance harmful to a manufacturing process and the light filter itself is not included, the danger for a human body is reduced and environmental safety is raised.

[Translation done.]